Inventory of State Government-Operated Public Safety Communications Systems

A report prepared by the State Interoperability Executive Committee

December 19, 2003

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A Message from the Chair

I am pleased to provide the results of the State Interoperability Executive Committee (SIEC) inventory of state government operated public safety communications systems within Washington state. All state government agencies with a public safety mission responded to the survey. This report provides an overview of the current communication systems used by Washington state public safety agencies.

The SIEC is also on a very aggressive timeline to inventory statewide communications systems and develop a statewide interoperability plan. The final plan will be completed by December 31, 2004. The statewide plan will set strategic direction for immediate and future work. During the planning process, we will involve as many public safety organizations as possible to represent federal, state, local and tribal views.

On behalf of all the members of the State Interoperability Executive Committee, I strongly encourage your ongoing support in helping solve the complex interoperability issues facing law enforcement officers, firefighters, highway maintenance workers, emergency medical service providers, and other public safety officials supporting the citizens of Washington state.

Sincerely,

Ronal Serpas
Chair, State Interoperability Executive Committee
Chief, Washington State Patrol

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Executive Summary

Overview

On April 16, 2003, Governor Gary Locke signed Substitute House Bill 1271 into law, which established a State Interoperability Executive Committee (SIEC). The SIEC is responsible for ensuring interoperability through the proper management and coordination of the state's investments in radio communications and licensed spectrum.

Major responsibilities of the SIEC include:

- Conduct an inventory of state government-operated public safety communications systems, and present the inventory to the Information Services Board and appropriate Washington state legislative committees by December 31, 2003;
- Complete an interim statewide public safety communications plan by March 31, 2004;
- Conduct an inventory of all public safety communications systems in the state, to include local governments, by July 31, 2004; and,
- Complete a final statewide public safety communications plan no later than December 31, 2004.

This report provides information gathered as a result of the recently completed inventory of state government-operated public safety communications systems, and completes the SIEC's first required task as outlined in its enabling legislation.

The intent of this document is to highlight information contained within the inventory and provides a brief summary of important conclusions drawn from this data.

The next step for the SIEC is to complete an interim statewide public safety communications plan based upon the results of this report. That plan is due to the legislature by March 31, 2004.

Key Findings

- The estimated replacement value[1] of state government-operated communication systems assets, based on survey responses, is $ 186.4 million. This figure is not intended to provide a cost estimate to develop an interoperability solution. However, this figure includes an estimated $124.1 million in infrastructure equipment and $62.3 million in radio equipment, interoperability devices, and other communications assets.

- State agencies have a significant investment in backbone infrastructure (e.g. microwave, fiber optic circuits or leased lines); approximately $124 million, not including the cost of land or communication circuits. It is also not clear that agencies have fully leveraged infrastructure investments to eliminate possible duplication.

- The inventory indicates a significant use of public cellular and pager technology. These systems may become quickly overloaded in an emergency and may not be available or function as required during times of crisis.

- A limited number of interoperability assets have recently been purchased. These assets will allow disparate radio communication systems to connect and interoperate during major incidents.

- The majority of state agencies communicate on three different radio frequency bands. In the absence of some type of intermediary technology, it is impossible for radios using different frequencies to communicate with each other.

- The vast majority of state radio assets use older analog technology.

- Agencies do not share a common standard for Command and Control structure or communications protocol for major incidents.

[1] "Replacement value" refers to the cost of purchasing similar technology that may be older technology and no more interoperable than current systems.

Washington State Quick Facts

Total state agency public safety communications assets reported by inventory respondents, include 27,078 devices such as pagers, cell phones, mobile radios, portable radios, base stations, console positions, and mobile data terminals.

Four agencies, Washington State Patrol (WSP), Washington State Department of Transportation (WSDOT), Department of Natural Resources (DNR), and the Department of Corrections (DOC), operate 83 percent of the state's technology.

A very small number of radios are capable of meeting Project 25 (P25) interoperability standards.

State agencies have a total of 147 technical support staff supporting communication systems (not including dispatchers).

Excluding communications systems infrastructure, Washington state public safety agencies reported having the following public safety communications assets:

- 7,918 portable radios
- 8,535 mobile radios
- 90 console positions
- 822 repeaters
- 4,899 cellular phones
- 4,284 pagers
- 533 mobile data terminals

Background

The tragedy of September 11, 2001 served as a catalyst for public safety agencies across the nation to re-examine how they communicate with each other in times of crisis.

To address emergency communications system interoperability in Washington State, Governor Gary Locke signed Substitute House Bill 1271 into law April 16, 2003, which created the State Interoperability Executive Committee (SIEC).

The intent of this legislation is to ensure interoperability through the proper management and coordination of the state's investments in radio communications systems and licensed spectrum. In addition to creating the inventories and plans listed above, responsibilities include:

- Develop and recommend technical standards for state wireless radio communication systems to the Information Services Board (ISB)
- Coordinate and manage on behalf of the ISB the licensing and use of state-designated and state-licensed radio frequencies
- Seek support including possible federal funding, or other funding, for state-sponsored wireless communications
- Develop recommendations for legislation that will promote interoperability
- Develop recommendations for legislation that may be required to promote interoperability of state wireless communications systems
- Foster cooperation and coordination among public safety and emergency response organizations
- Work with wireless communications groups and associations to promote interoperability among public safety and emergency response organizations

Inventory Methodology

Survey

The SIEC designed a questionnaire to create a snapshot of each state public safety agency's communication assets. This questionnaire was developed in a series of meetings that started in July; the final work product was completed in mid-September. The survey was distributed in September 2003, and respondents were asked to complete the survey no later than October 31. The inventory information collected by the survey will also be used in the preparation of the final statewide public safety communications plan due December 31, 2004.

Agencies Surveyed

After determining which state agencies have public safety missions, the SIEC performed additional research based upon jurisdictional authority. Agencies with general law enforcement authority, such as the Department of Fish and Wildlife, were included in this report. Agencies with limited law enforcement powers, such as the University of Washington Campus Police Department, whose jurisdiction ends at the campus property line, were excluded from this initial list of agencies (agencies similar to the University of Washington Campus Police Department will be included in the larger statewide inventory).

Based on these criteria, 10 state agencies were identified. The agencies that responded to this survey include:

- Washington State Patrol[2] (WSP)
- The Washington State Fire Marshall (included in WSP figures)
- Washington State Department of Transportation (WSDOT)
- Washington State Department of Corrections (DOC)
- Washington Department of Fish and Wildlife (DFW)
- Washington State Department of Natural Resources (DNR)
- Washington Department of Parks and Recreation (Parks and Recreation)
- Washington State Department of Health (DOH)
- Washington State Department of Ecology (Ecology)
- Washington State Department of the Military (National Guard)[3]
- Washington State Emergency Management Division (EMD)

[2] The Washington State Patrol and the Washington State Fire Marshals Office share the same radio system. For the purposes of this survey, WSP will represent both agencies.

[3] There are three National Guard divisions represented in this survey. There are two Air National Guard Units and one Army National Guard Unit. Whenever possible, all similar data will be captured under the heading of "NG."

Communication Assets

The inventory focused on six major areas of public safety communications assets:

- Radio equipment
- Infrastructure
- Cellular and pager technology
- Specialized interoperability equipment
- State radio frequencies
- Command and control protocols

Although communications assets were the primary targets of the inventory, other factors also affect the interoperability of a communications system. For this reason, agencies were also asked to provide information on the frequencies they use and if they were using a generally accepted incident response protocol.

Detailed information regarding each of these areas is provided in the sections that follow.

Radio Equipment

Overview

State public safety agencies were asked a series of questions to determine the types of technology and quantities of radios they were using. Radio equipment can be differentiated by size and function.

Types of Radio Equipment

- Portable
- Mobile
- Base stations/repeaters

Portable radios are those that can be carried by a person. They are typically small, lightweight and have limited range for transmission.

Mobile radios may be mounted in a car or truck. These radios have a greater range than portable radios.

Base stations/repeaters are usually mounted at a fixed location (communication center) and have the greatest transmission range. Base station radios may also be configured as repeaters. Repeaters typically "hear" a radio signal and re-broadcast that signal.

Radio Equipment Technology

Each of the radios above can use one of three types of primary technology to communicate with other devices.

- Analog
- Digital
- P25

Analog radios/technologies are typically older radios used by public safety agencies in the United States. The analog signal uses waveform transmissions – rather than zeros and ones – that digital systems use. The advantage of analog systems is that in fringe reception areas, some transmission is actually heard, although the transmission may be mostly static. The disadvantage of analog technology is that systems are more prone to interference, static and eavesdropping than the newer digital technologies. Analog systems are still being deployed in many parts of the world where the advanced technology (and higher cost) of digital systems are not required.

Digital radios/technology are a newer form of wireless communications that take voice transmissions and convert them to digital output (zeros and ones) and then reconstruct them into the original voice format when the signal is received. This technology is more secure than analog technology and is also less subject to static or fading signals.

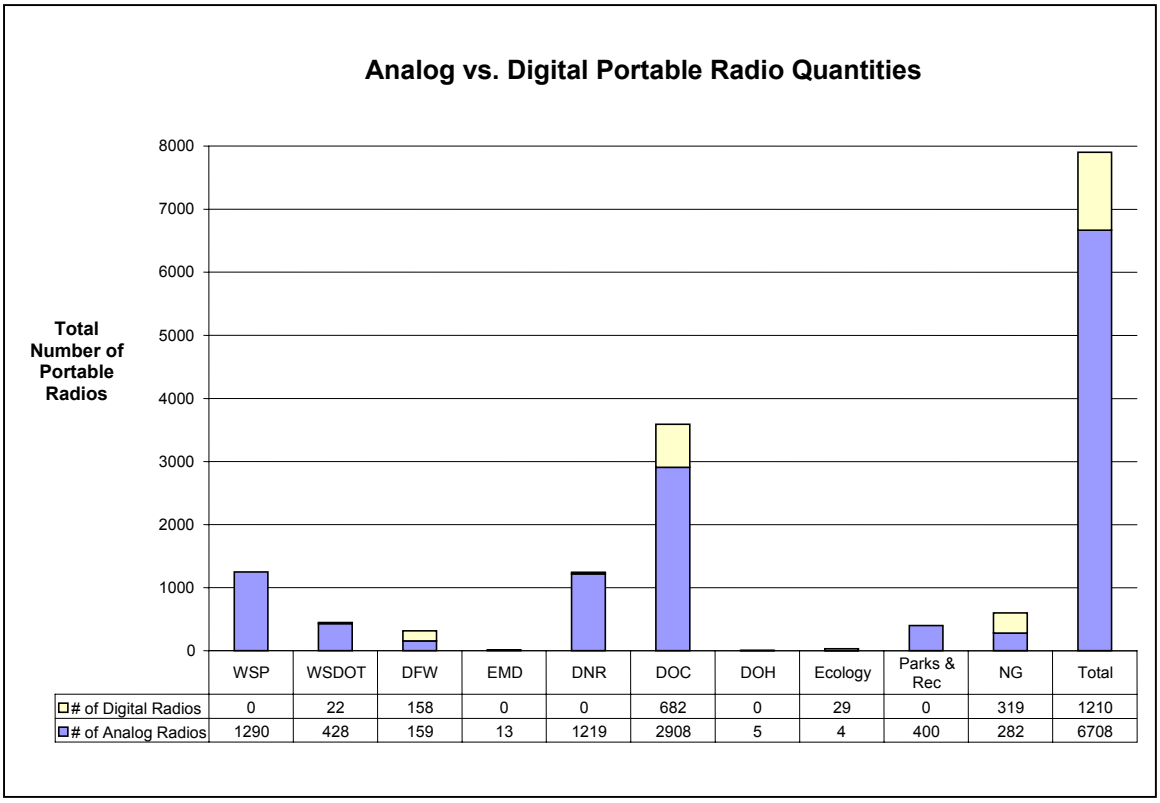
P25 radios/technology are a set of standards that enable radio vendors to build radios to specifications, which within a given frequency allow all agencies to communicate with each other without regard to manufacturer. P25 is a set of standards preferred by SAFECOM[4] and many federal agencies.

[4] SAFECOM was established to serve as the umbrella program within the Federal government to help local, tribal, state and federal public safety agencies improve public safety response through more effective and efficient interoperable wireless communications. For additional information on SAFECOM, visit their Web site at http://www.whitehouse.gov/omb/egov/gtog/safecom.htm.

Inventory Information

Portable Radio Equipment

Figure 1 shows the total number of **portable** radios currently in use, and of those, how many are analog and digital.

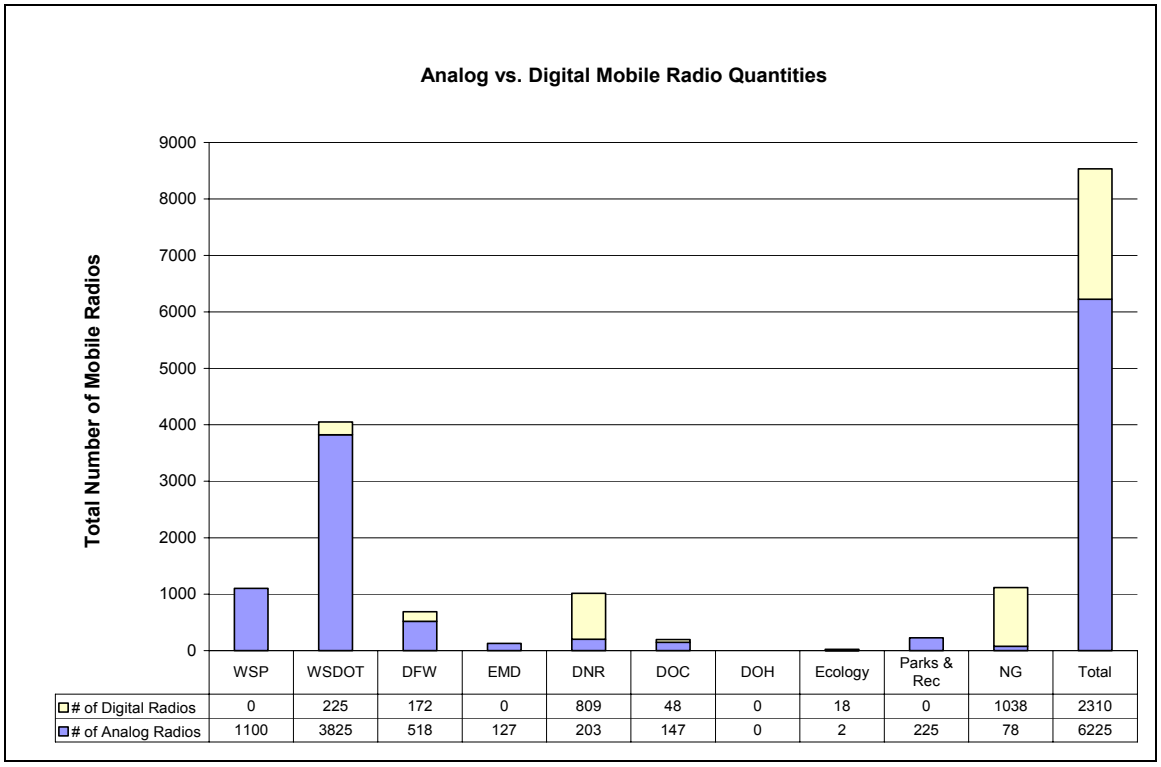


	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Rec	NG	Total
# of Digital Radios	0	22	158	0	0	682	0	29	0	319	1210
# of Analog Radios	1290	428	159	13	1219	2908	5	4	400	282	6708

Figure 1

Mobile Radio Equipment

Figure 2 shows the total number of **mobile** radios currently in use, and of those, how many are analog and digital.

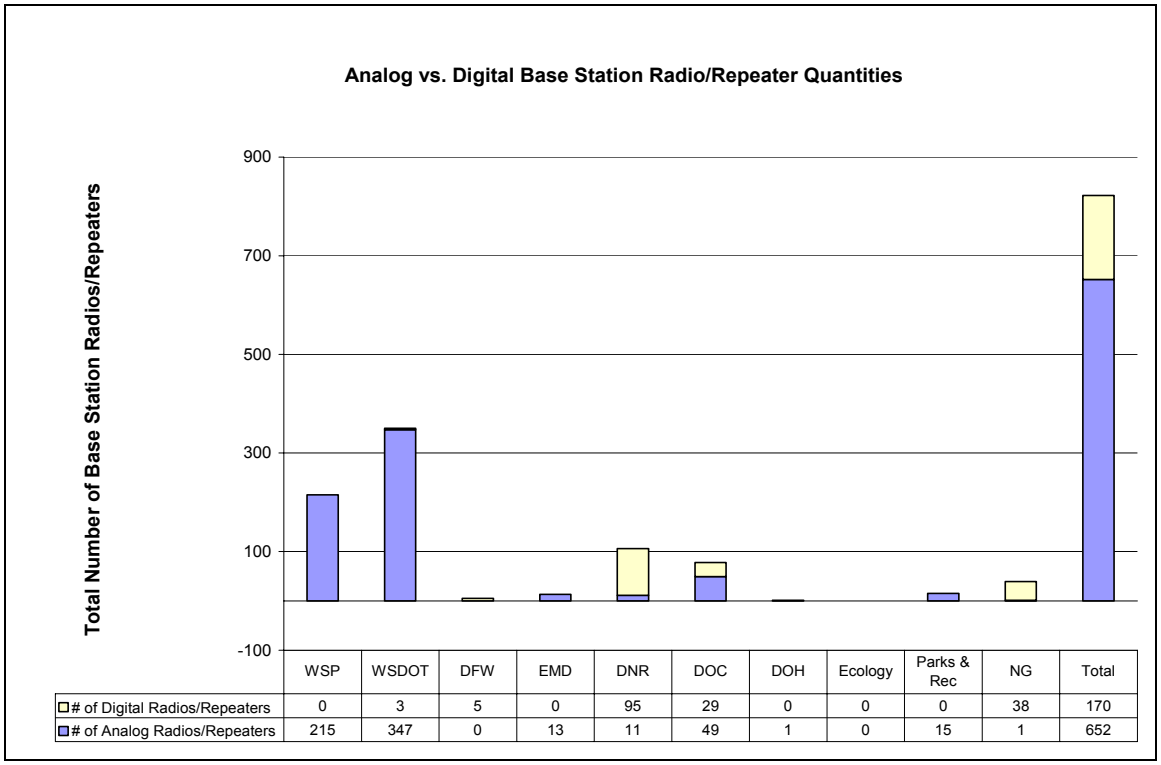


	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Rec	NG	Total
# of Digital Radios	0	225	172	0	809	48	0	18	0	1038	2310
# of Analog Radios	1100	3825	518	127	203	147	0	2	225	78	6225

Figure 2

Base State/Repeaters

Figure 3 represents the total number of **base station** radios that are being used in Washington state. Bars represent the number of analog and digital radios that are being used.



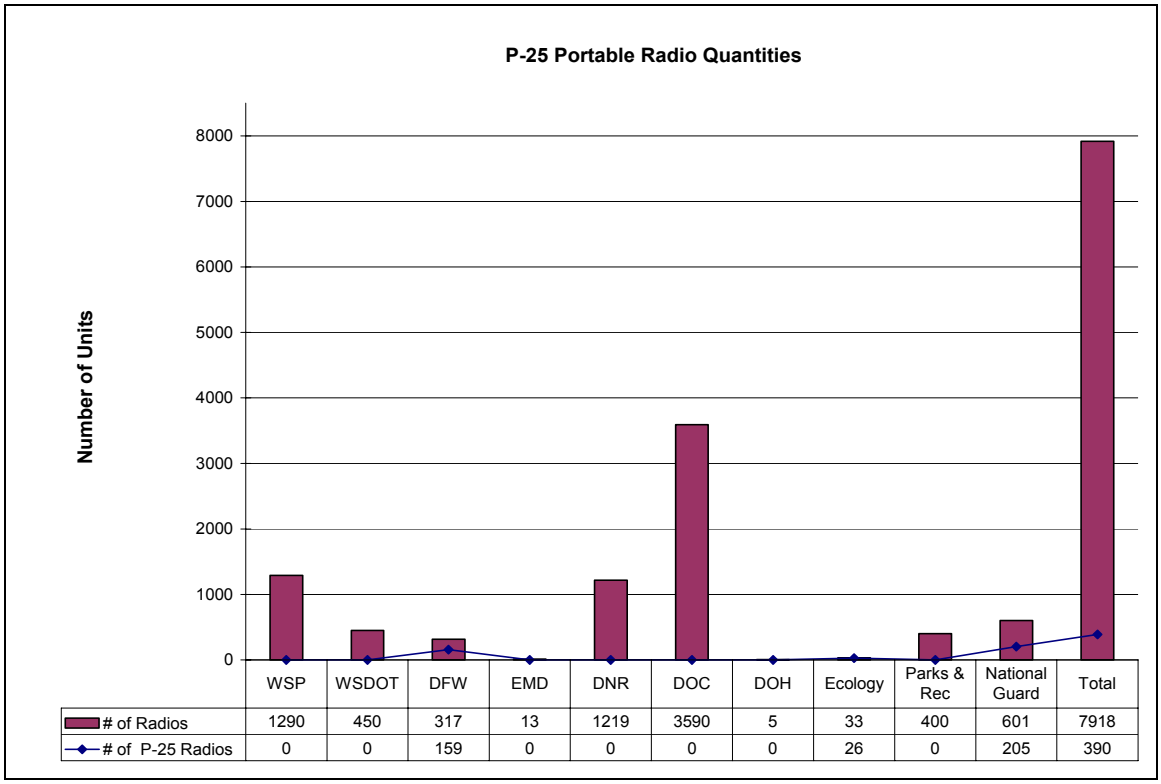
	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Rec	NG	Total
# of Digital Radios/Repeaters	0	3	5	0	95	29	0	0	0	38	170
# of Analog Radios/Repeaters	215	347	0	13	11	49	1	0	15	1	652

Figure 3

The vast majority of state radio assets are analog. As indicated earlier in this report, analog technology is older technology, and was used by most agencies many years ago. The Department of Natural Resources, the Department of Corrections, and Department of Fish and Wildlife use digital technology, which is a newer, more robust and more expensive technology.

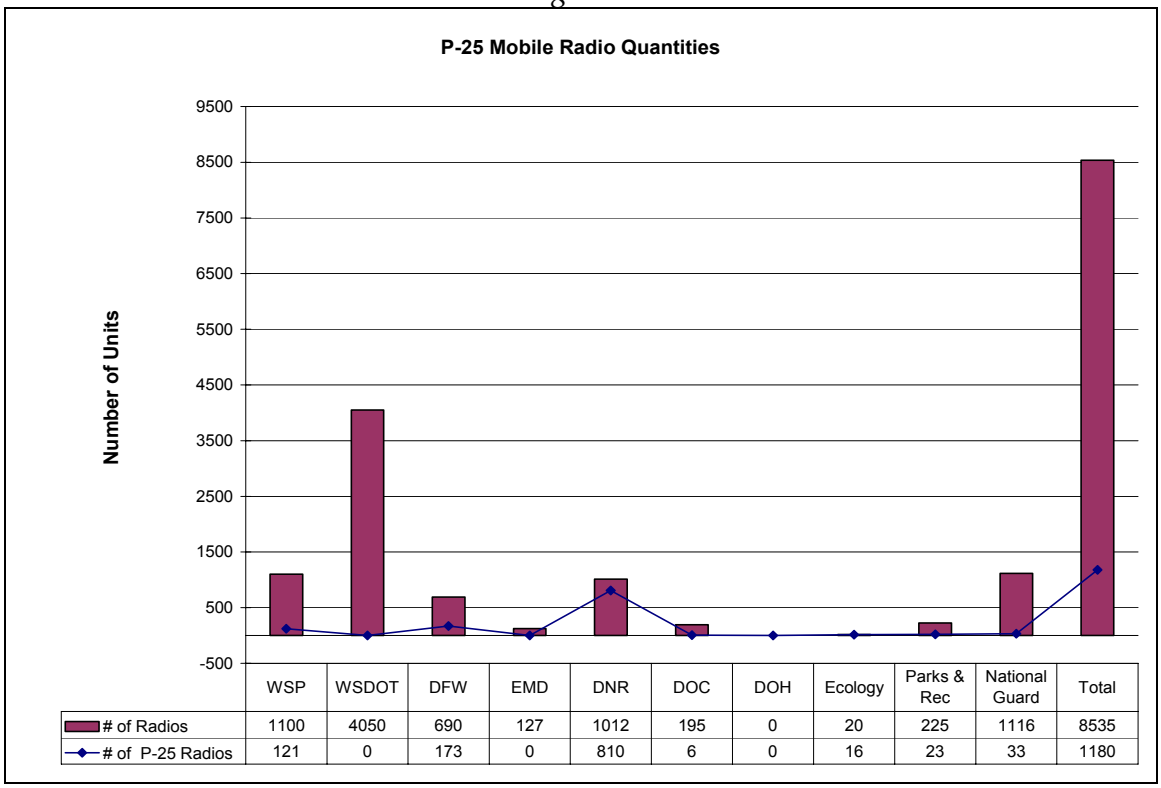
Project 25-Based Equipment

Project 25 (P25) is a standard mandated for use by federal agencies and is preferred by the SAFECOM program, a Presidential e-government initiative. State Homeland Security grants strongly encourage communication equipment to be P25 capable as a requirement for funding. As highlighted in Figures 4, 5, and 6, survey respondents show a low percentage of current equipment that is P25 compliant. A major consideration of P25 deployment is high equipment cost.



	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Rec	National Guard	Total
# of Radios	1290	450	317	13	1219	3590	5	33	400	601	7918
# of P-25 Radios	0	0	159	0	0	0	0	26	0	205	390

Figure 4



	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Rec	National Guard	Total
# of Radios	1100	4050	690	127	1012	195	0	20	225	1116	8535
# of P-25 Radios	121	0	173	0	810	6	0	16	23	33	1180

Figure 5

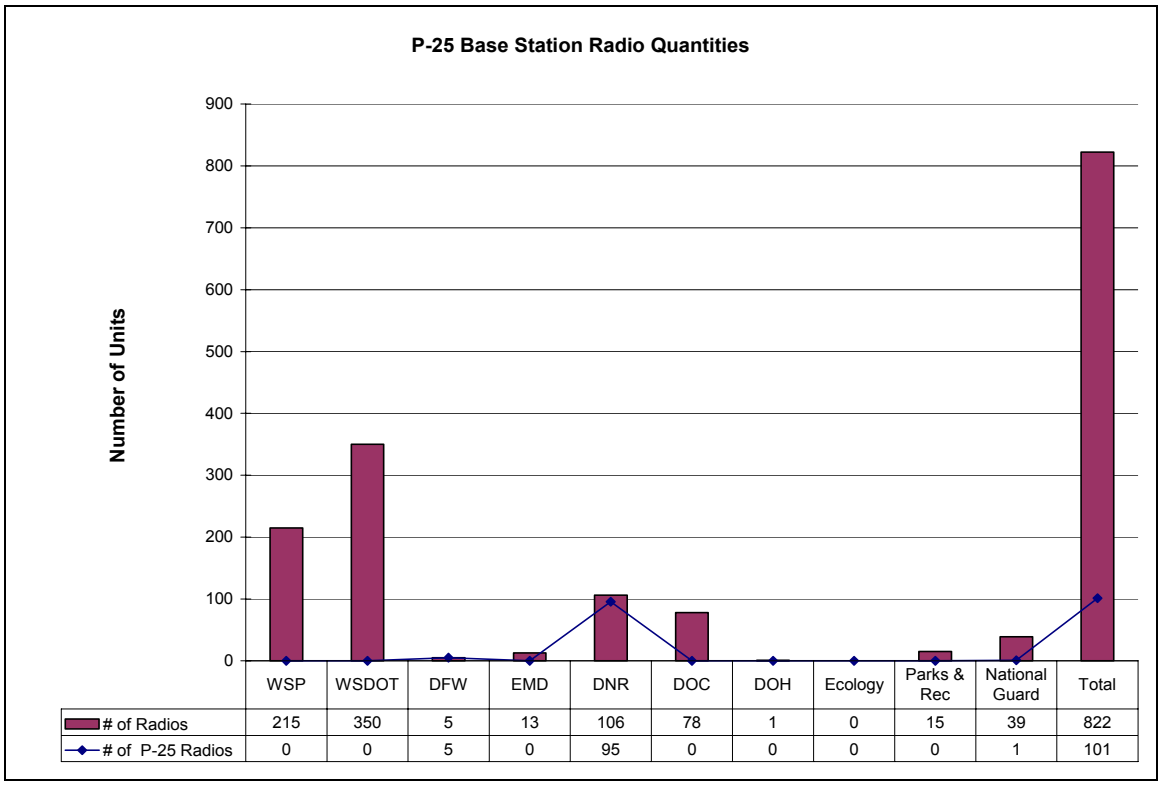
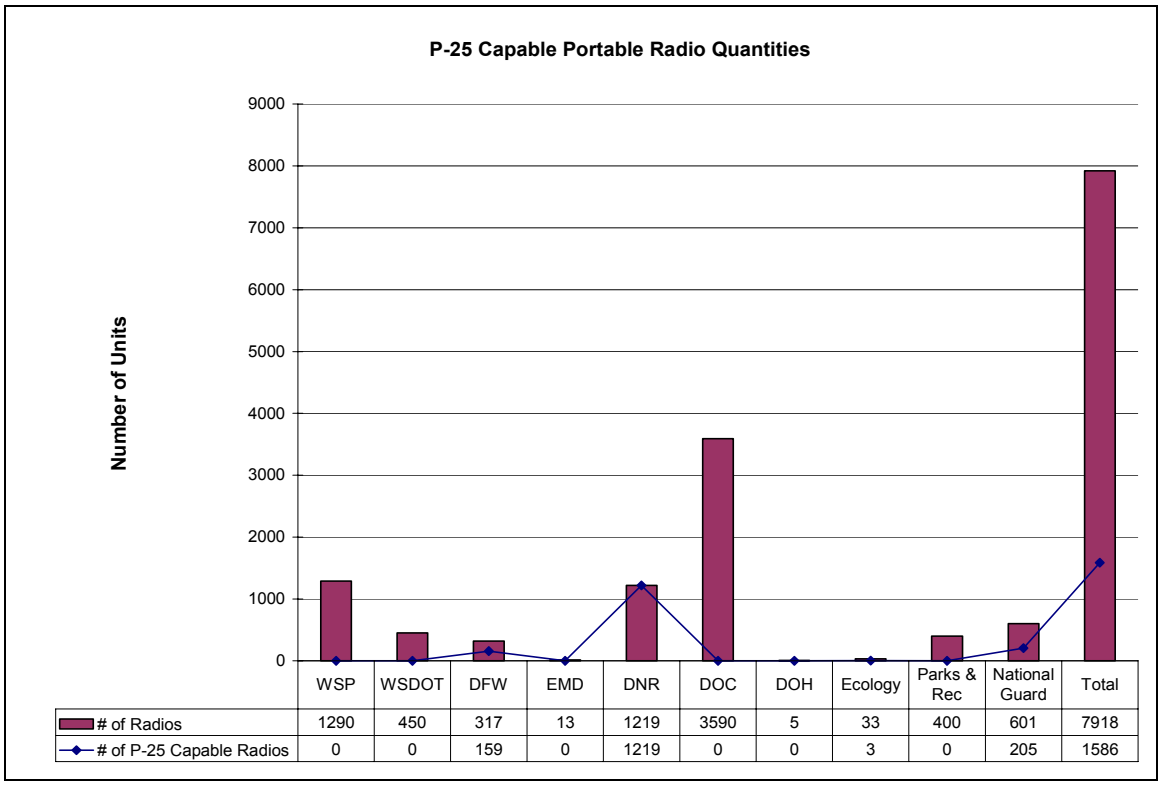


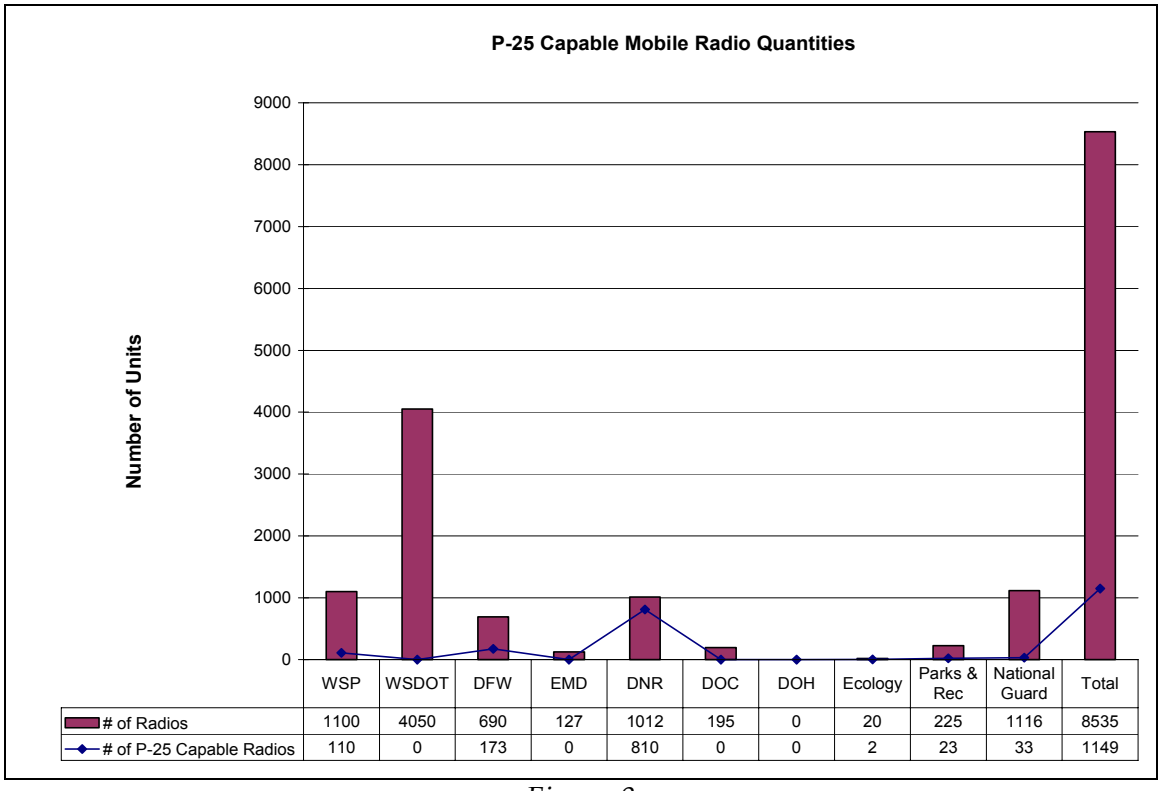
Figure 6

A number of state agencies possess equipment capable of being upgraded to the P25 standard. *(Figures 7-9*) This is important - should the state elect to use P25 as a standard. This equipment can be upgraded at minimal cost.



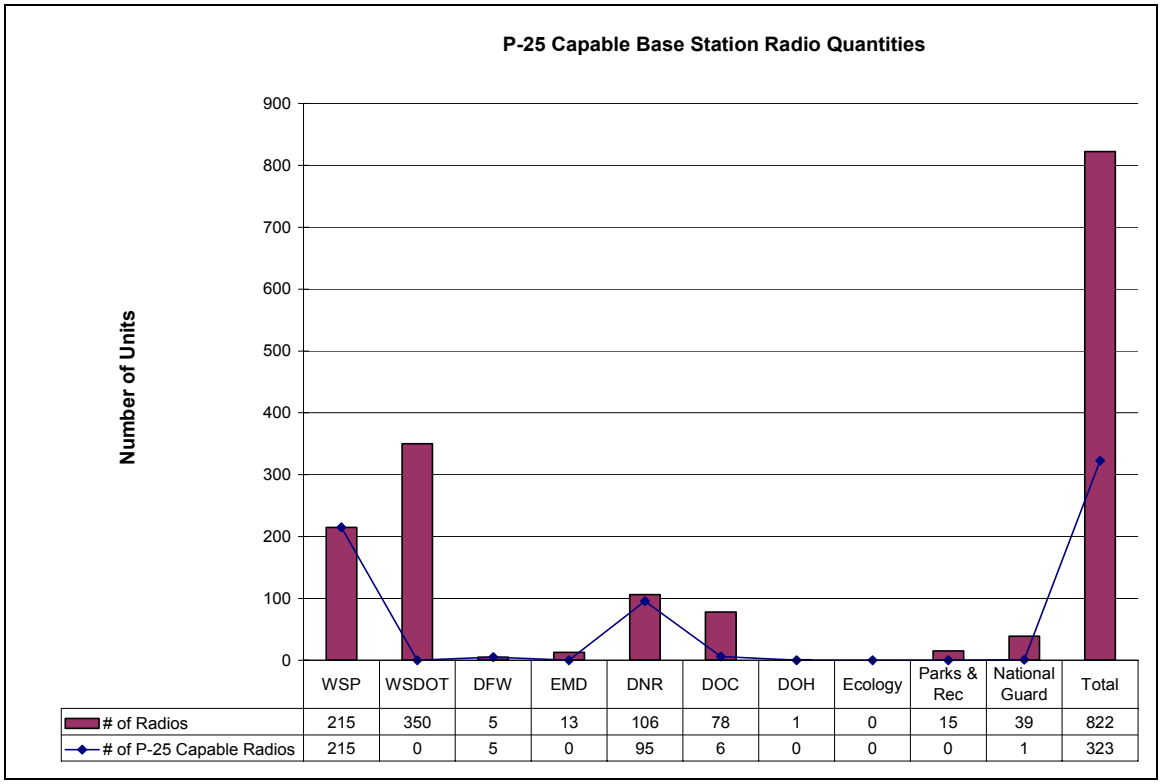
	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Rec	National Guard	Total
# of Radios	1290	450	317	13	1219	3590	5	33	400	601	7918
# of P-25 Capable Radios	0	0	159	0	1219	0	0	3	0	205	1586

Figure 7



	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Rec	National Guard	Total
# of Radios	1100	4050	690	127	1012	195	0	20	225	1116	8535
# of P-25 Capable Radios	110	0	173	0	810	0	0	2	23	33	1149

Figure 8



	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Rec	National Guard	Total
# of Radios	215	350	5	13	106	78	1	0	15	39	822
# of P-25 Capable Radios	215	0	5	0	95	6	0	0	0	1	323

Figure 9

The P25 standard is intended to promote interoperability through the use of "open" technology standards. P25 will not solve the issue of state agencies located in multiple frequency bands. P25 is not a complete solution, but one of many tools used to resolve interoperability issues.

Infrastructure

Overview

The purpose of radios is to initiate and receive transmissions. "Infrastructure" refers to the equipment, physical facilities, networks or other communications components required to move or transmit information between end points.

Radios typically work using relatively low power to transmit over limited areas. The distance that a radio wave can travel is determined by the power generated by the radio itself, the frequency of the radio wave, and the terrain over which the radio wave must travel. Terrain plays a large role in how far a signal can be detected, as radio waves travel in straight lines, often times called "line of sight."

To ensure that the relatively weak signal emitted by a radio device can be propagated over long distances, microwave towers must be located at geographically strategic locations. Microwave towers use a high-frequency electromagnetic wave to transmit information. These towers receive signals that are broadcast by radios or other towers, amplify the signal and then pass it along, either to another tower or to a radio.

Additionally, other "wired" assets, such as dedicated high capacity communication circuits can be used as a medium to reliably move radio communications from the source to its intended destination.

Major Infrastructure Components

The inventory survey gathered information regarding four major infrastructure components:

- Analog microwave towers
- Digital microwave towers
- Dedicated or "leased" lines
- Optical fiber

Analog microwave towers/equipment send multiple voice channels over a single microwave frequency beam. Analog technology has been used by the state since the 1950s.

Digital microwave towers/equipment use digital technologies to transmit information using bits and bytes over a single beam. Digital technologies allow the transmission of multiple formats, such as voice, video and data simultaneously.

A **leased line** is a communication circuit that has been leased from a telecommunications company or other source for private use.

Optical fiber refers to the transmission of information as light impulses along a glass fiber. Optical fiber can carry significantly more information at faster rates than conventional copper wire and is not subject to electromagnetic interference.

Infrastructure by Location

The table below provides a by-county view of major infrastructure components, which illustrates where equipment is either located or being used, and which agency or agencies have primary control or ownership of each component.

County	Fiber	Analog Microwave Towers	Digital Microwave Towers	Leased Lines
Adams		WSP		WSP
Asotin				WSP
Benton	WSDOT	WSP, WSDOT	WSP, EMD	WSP, EMD
Chelan	WSDOT	WSP	WSP, WSDOT	WSP, WSDOT
Clallam		WSP		WSP, DNR
Clark	WSDOT	WSP, WSDOT	WSP, WSDOT	WSP, WSDOT
Columbia		WSP, WSDOT		WSP
Cowlitz	WSDOT	WSP, WSDOT	WSP, WSDOT	WSP
Douglas		WSP, WSDOT	WSP	WSP
Ferry		WSP, WSDOT		WSP
Franklin	WSDOT	WSP, WSDOT		WSP
Garfield		WSP, WSDOT		WSP, WSDOT
Grant		WSP, WSDOT	WSP	WSP, WSDOT
Grays Harbor		WSP, WSDOT		WSP
Island		WSP		WSP
Jefferson		WSP, WSDOT		WSP
King	WSDOT	WSP, WSDOT	WSP, WSDOT, DNR	WSP, WSDOT
Kitsap		WSP	WSP, WSDOT	WSP
Kittitas		WSP, WSDOT	WSP, DNR	WSP
Klickitat		WSP, WSDOT		WSP

Lewis		WSP, WSDOT	WSP	WSP
Lincoln		WSP, WSDOT	WSP, WSDOT	WSP
Mason		WSP		WSP
Okanogan		WSP, WSDOT	WSDOT	WSP, WSDOT
Pacific		WSP	WSDOT	WSP
Pend Oreille				WSP, WSDOT
Pierce	EMD	WSP	WSP, EMD	WSP, EMD
San Juan		WSDOT		WSP
Skagit		WSP, WSDOT	DNR	WSP
Skamania		WSP, WSDOT		WSP
Snohomish		WSP	WSP	WSP
Spokane	WSDOT	WSP, WSDOT	WSP, WSDOT	WSP, WSDOT
Stevens		WSP, WSDOT	WSDOT, DNR	WSP
Thurston		WSP, WSDOT	WSP, WSDOT. EMD	WSP, EMD
Wahkiakum				WSP
Walla Walla		WSP, WSDOT		WSP
Whatcom		WSP, WSDOT	WSDOT	WSP
Whitman		WSP, WSDOT		WSP
Yakima	WSDOT	WSP, WSDOT	WSP	WSP, WSDOT

Table 1

As *Table 1* shows, the Washington State Patrol and the Washington State Department of Transportation account for the majority of the key infrastructure components throughout the state. Further, the majority of microwave towers operated by state agencies in Washington are analog.

Although these tower facilities may be owned and maintained by a single agency, many of these facilities are actually used by multiple agencies under a joint operating agreement to leverage land, power and facility costs. This information, however, is not depicted in the table.

Microwave Tower Information

While the exact number and nature of microwave towers owned and operated by state agencies was not addressed by the inventory survey, further investigation revealed that there are approximately 296 microwave sites occupied by state agencies. The approximate by type and number are:

- **Large communications sites (90)** operated primarily by the Washington State Patrol and Washington State Department of Transportation. Large communications sites are critical microwave backbone communications sites. These sites include high-capacity microwave, tower, permanent buildings, fixed base stations, commercial power, generators and battery backup. These sites include multiple state agencies operating independent radio systems. These sites are found on the Washington State Patrol's microwave backbone.

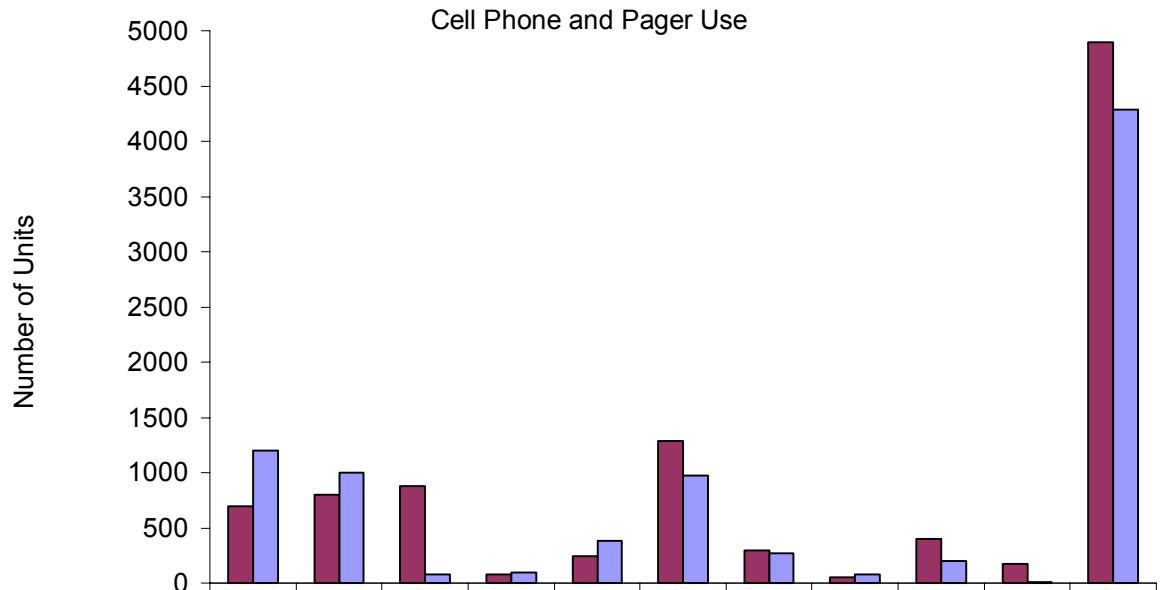
- **Medium-sized communications sites (90)**. Medium-size radio communications sites include a telecommunication link (these links may consist of low-capacity microwave, state-owned, or -leased communication circuits), tower, permanent building, generator, commercial power, fixed base stations and battery backup. These sites may include multiple state agencies. The difference between large and median sites is building size and type, tower structure and microware capacity. These sites are not found on the microware backbone.

- **Small communications sites (116)**. Small communications sites are typically fill-in communications sites. Commercial power, telecommunication links and generators may be present. Site cost is due primarily to a radio shelter and tower cost. These sites are typically operated by a single agency. The primary difference between medium and small sites is building and tower cost.

Cellular and Pager Technology

State agencies depend on commercial cellular and pager technology as identified below (*Figure 10).*

A concern expressed repeatedly by public safety organizations nationwide is the unpredictability of commercial cellular service during times of emergency. Public safety organizations must be able to communicate in situations from routine daily operations to natural disasters, and to acts of terrorism. Commercial service providers often fail to balance the needs of commercial customers with the communication requirements of public safety organizations. Survey results show that some agencies have a high percentage of cell phones compared to radios. These respondents may not be able to communicate effectively in an emergency.



	WSP	WSDOT	DFW	Emerg Man Div	DNR	DOC	DOH	Ecology	Parks and Rec	National Guard	Total State Assets
# of Cell Phones	700	800	874	75	240	1286	300	50	400	173	4898
Number of Pagers	1200	1000	75	95	384	970	270	80	200	10	4284

Figure 10

Interoperability Equipment

Overview

In addition to asking respondents to provide information regarding the current state of their radio systems, agencies were also asked to identify specialized interoperability assets. Responses indicate that some agencies currently have, or expect to soon acquire, special interoperability equipment. This equipment is as follows:

- Incident Commanders' Radio Interface (ICRI)
- Satellite phones
- ACU-1000 communication switches
- Transpeaters

ICRI is a mobile device that can be used to connect several disparate radio systems in an *ad hoc* manner. It is relatively small and can be effectively used by non-technical personal.

Satellite phones are used by many state agencies to communicate with others in the event that existing radio infrastructure is no longer operational. Satellite phones can also be used in place of cellular technology or the public switched network.

The **ACU-1000** is a communication switch that may be mobile or stationary and can be used to connect several disparate radio systems. The ACU-1000 is a robust cross-connection platform that allows for *ad hoc* radio "patching." The ACU-1000 is recognized by the U.S. Department of Justice as one of the best solutions to create temporary interoperability. These systems use radio/frequency and can be quickly set up when necessary.

Transpeaters may be used as either mobile or stationary cross-band repeaters. By connecting two conventional radios to a transpeater system, the normal range of radios is substantially extended. Also, these devices enable individuals using different frequencies to communicate with each other as necessary.

Interoperability Equipment in Use Today

The Emergency Management Division (EMD) uses several interoperability solutions to enhance their ability to communicate with other agencies throughout the state. EMD has an ICRI, which is a mobile device that can connect several disparate radio systems to each other in an *ad hoc* manner to enable interoperability in an emergency. EMD is also able to communicate with each of the state's local government Emergency Operations Centers in times of crisis using a statewide radio network. EMD has 30 satellite phones that can be used when typical landline and radio infrastructure are not available. EMD also has one transpeater, which is another type of cross-band repeater.

The Washington State Patrol and the Fire Marshal's Office have obtained funding for eight ACU-1000s. Two of these will be mobile and six will be placed in strategic locations throughout the state.

The Department of Corrections (DOC) has one mobile ACU-1000.

The Department of Transportation (WSDOT) has 35 transpeaters that can be used as cross-band repeaters and five satellite phones that may be used when landline and radio infrastructure are not available.

The Department of Natural Resources has ten transpeaters that can be used as cross-band repeaters when necessary.

The Department of Health has five satellite phones that may be used in an emergency.

The Department of Ecology has one satellite phone. Ecology also has 20 CMD750 radios that are mounted in vehicles. These radios are used to communicate with the state Emergency Operations Center.

It is important to understand that although some existing equipment can be used to create *ad hoc* networks, most specialized interoperability units must be driven to or dropped into place at the scene, thereby consuming valuable response time. As a result, it is important to conduct thorough pre-planning to determine strategic placement of this equipment so that it can be mobilized and deployed with minimal delay.

For a summary of this information, review Appendix G.

State Radio Frequencies

There are ten frequency bands available for nationwide public safety use. Washington state agencies use three frequency bands to communicate across organizational/jurisdictional boundaries.

The departments of Transportation, Corrections and Health use communication systems operating in the 800 MHz frequency band. The National Guard and Emergency Management Division operate systems within the radio spectrum reserved for federal agencies. The remainder of state agencies operate communication systems within the 150 MHz frequency band.

Overall, the vast majority of state agency radio assets use the 800 and 150 MHz bands. Approximately 62 percent of radio assets operate at 800 MHz and 37 percent at 150 MHz with the remaining 1 percent operating in the 138 MHz range. Of the agencies that currently use the 800 MHz band, the Department of Corrections accounts for 42 percent of the assets in this grouping. Most of the Department of Corrections' radios are, however, used within the limited confines of correctional institutions. Other state agencies, like the Department of Transportation and the Washington State Patrol, communicate across multiple counties within the state of Washington (see *Table 2* below).

AGENCY	*Frequency*	*Platform*	*Use as a % of State Total*
Washington State Patrol	148-174	Kenwood	15%
Department of Transportation	851-869	EFJ	32%
Fish and Wildlife	148-174	Motorola	7%
Emergency Management Division	138-144	Motorola	1%
Natural Resources	148-174	Relm	15%
Department of Corrections	851-869	Motorola	26%
Department of Health	851-869	EFJ	0%
Department of Ecology	148-174	Motorola	0%
State Parks and Recreation	148-174	Kent	4%

Table 2

Command and Control

In times of crisis, a systematic and organized method of using public resources is essential. The survey asked public safety agencies if the agency currently used a command and control structure or an incident command protocol. The responses are shown in *Table 3* below. One of the more significant results of this survey discovered that no generally accepted command and control/incident command structure existed.

Command and Control Structure or incident command protocol	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Recreation	National Guard
NIIMS/ISC	X				X			X		
Form 205 template				X						
Self developed template										
Ad hoc										
Law Enforcement Mobilization			X							
Military Annex K										X

Table 3

Financial Analysis

Over the years, the state has accumulated a large number of radios, antennas and required equipment. Due to the relatively stable technology platforms upon which this equipment is based, much of this equipment continues to be used long after it has fully depreciated, or in some cases, even supported by the manufacturer.

To determine a value for state government-operated public safety communications systems, staff reviewed information in the state Computer Asset Management System (CAMS) and compared this information to data gathered directly from a limited number of agencies. CAMS significantly underestimated the value of radio assets.

To develop a better-estimated value for these assets, it was necessary to first gather inventory information on the types and quantities of different equipment. Based on the information obtained, agencies were contacted a second time to provide estimates of equipment cost when purchased new and what its current replacement value might be.

To provide a cost valuation of agency systems, the survey uses the number of each type of asset multiplied by an average unit cost to estimate the initial investment cost for assets.

Estimated valuation for state government-operated public safety communication equipment is as follows:

Radio Equipment

Replacement value of radio equipment is valued at approximately $64 million. This includes all radio equipment pagers, cell phones and interoperability equipment.

Infrastructure

Microwave Towers/Equipment costs include building, equipment and facilities costs, but do not include the cost of the land on which they are located.

Description	Quantity	Estimated Unit Cost	Estimated Extended Cost
Large Microwave Sites	90	$1,000,000	$90,000,000
Medium-Sized Communications Site	90	$250,000	$22,500,000
Small Communications Site	116	$100,000	11,600,000
		Total	**$124,100,000**

Appendix H provides a more detailed view of estimated equipment and initial inventory and replacement costs.

Key Observations

1. Communications equipment in some state agencies is becoming difficult to maintain and presents a significant interoperability challenge. One agency reported purchasing older radios from E-Bay since replacement parts are no longer manufactured.

2. The estimated replacement value of state government-operated communication systems assets is $188.1 million. This figure is not intended to provide a cost estimate to develop an interoperability solution. This figure includes an estimated $124.1 million in infrastructure equipment and $64 million in radio equipment, interoperability devices and other communications assets.

3. State agencies have a significant investment in backbone infrastructure (e.g. microwave, fiber optic circuits or leased lines); approximately $124 million, not including the cost of land or communication circuits. It is also not clear that agencies have fully leveraged infrastructure investments to eliminate possible duplication.

4. The inventory indicates a significant use of public cellular and pager technology. These systems may become quickly overloaded in an emergency and may not be available or function as needed during times of crisis.

5. A limited number of interoperability assets have been purchased recently. These assets will allow disparate radio communication systems to connect and interoperate during major incidents.

6. The majority of state agencies communicate on three different radio frequency bands. In the absence of some kind of intermediary technology, it is impossible for radios using different frequencies to communicate with each other.

7. The vast majority of state radio assets use older analog technology.

8. Agencies do not share a common standard for command and control structure or communications protocol for major incidents.

APPENDIX A

GLOSSARY OF WIRELESS TERMS

ACU-1000
The ACU-1000 is a communication switch that may be mobile or stationary and can be used to connect several disparate radio systems.

Ad hoc network
An *ad hoc* (or "spontaneous") network is a local area network or other small network, especially one with wireless or temporary plug-in connections, in which some of the network devices are part of the network only for the duration of a communications session, or in the case of mobile or portable devices, while in close proximity to the rest of the network. In Latin, *ad hoc* literally means "for this," further meaning, "for this purpose only," and thus usually temporary.

Analog
Analog was the first form of cellular service, launched in October 1983 in the U.S. (and earlier elsewhere). Using a waveform transmission instead of the zeros and ones that a digital system uses, it is more prone to interference, static, eavesdropping and cloning. It is still deployed in many parts of the world where the advanced technology (and higher cost) of digital systems is not deemed necessary.

Analog microwave towers
An analog microwave tower is equipment that sends multiple voice channels over a single microwave frequency beam.

Analog signal
An analog signal is a signaling method that uses constant changes in the amplitude or frequency of a radio transmission to convey information.

Backbone
A large communications system, a backbone carries voice or data collected from smaller communication systems that interconnect with it. The backbone may consist of microwave systems, towers, antenna and hardware that are used to carry a signal from one area to another.

Backbone network
A backbone network is the shared high-density portion of the state's telecommunications transmission facilities. It includes specially conditioned

high-speed communication carrier lines, multiplexors, switches associated with such communication lines, and any equipment and software components necessary for management and control of the backbone network**.**

Bandwidth

Bandwidth is the amount of spectrum required to transmit the signal without distortion or loss of information. FCC rules require suppression of the signal outside the band to prevent interference.

Bandwidth also has a general meaning with regard to how much information can be carried in a given time period (usually a second) over a wired or wireless communications link.

Base station

In personal communication service, base station is the common name for all the radio equipment that is located at one fixed location.

Digital

This is one of the newer forms of wireless communications. Digital captures all voice and data then transmissions and converts them to binary computer signals (zeros and ones). It then reconstructs them into the original format at the other end.

Digital Microwave

Digital microwave uses digital technologies to transmit information using bits and bytes over a single microwave beam.

ICRI

Incident Commanders Radio Interface is a mobile device that can be used to connect several disparate radio systems in an *ad hoc* manner.

Infrastructure

Infrastructure refers to equipment, physical facilities, networks or other communications components required to move or transmit information between end points.

Interoperability

An essential communication link within public safety and public service communications systems, interoperability permits units from two or more different entities to interact with each other and to exchange information according to a prescribed method to achieve predictable results.

Interoperability standard
An interoperability standard establishes engineering and technical requirements that are necessary to be engaged in the design of systems to ensure that systems can effectively communicate.

Leased line
A leased line is a communication circuit that has been leased from a telecommunications company or other source for private use.

Mobile
Permanently mounted equipment in a transport vehicle is considered mobile.

Network
A network is any connection of two or more computers, radios, phones, or other wireless devices that allows them to communicate. Networks may include transmission devices, servers, cables, routers and satellites.

On demand
On demand is when there is immediate availability under any circumstance.

Project-25
P25 ensures interoperability of trunked Public Safety communications systems produced by different manufacturers. Project-25 (P-25) is a set of standards that are used to ensure interoperability in other frequency bands as well.

Portable
Portable can easily be carried or conveyed by hand.

Public Safety (Services)
For the purposes of the SIEC, Public Safety Services are services that protect and preserve life, health, property and natural resources and are provided by state, federal, local or other government entities or by non-governmental organizations that are authorized by a government entity to provide such services.

Real time
Real time means there should be no noticeable delay between the time that information is sent and when it is received.

Repeater
A repeater is a device that receives a radio signal, amplifies it and retransmits it. It is used in wireless networks to extend the range of base station signals, and expands coverage more economically than by building additional base stations. Repeaters may be used for buildings, tunnels or difficult terrain.

Satellite phone
A satellite phone is a wireless phone that uses mobile satellite service to send voice and data.

Spectrum
Spectrum is the range of electromagnetic radio frequencies used in the transmission of sound, data and television.

Specific frequencies allocated to the public safety community are as follows:

High HF	25-29.99 MHz
Low VHF	30-50 MHz
High VHF	150-174 MHz
Low UHF	406.1-420/450-470 MHz
UHF TV Sharing	470-512 MHz
700 MHz	767-776/794-806 MHz
800 MHz	806-824/851-869 MHz

Telecommunications
Telecommunications is the transmission of information by wire, radio, optical fiber, electromagnetic or other means.

Transpeater
A transpeater is a device that may be used either mobile or stationary and acts as a cross-band repeater.

Trunking
Trunking is spectrum-efficient technology that creates a queue to handle demand for voice or data channels.

Ultra high frequency (UHF)
The UHF (ultra high frequency) range of the radio spectrum is the band extending from 300 MHz to 3 GHz.

The UHF band is widely used for satellite communication and broadcasting, cellular telephone and paging systems, and by third-generation (3G) wireless services.

Very high frequency (VHF)
VHF is the part of the radio spectrum from 30 to 300 MHz. This includes TV Channels 2-13, the FM broadcast band, and some marine, aviation and land mobile services.

Wireless

Wireless uses the licensed or unlicensed radio-frequency spectrum for transmitting and receiving voice, data and video signals via 802.11xx, cellular networks, land mobile radios, personal digital assistants, notebook computers and other evolving technologies and methods.

APPENDIX B

STATE INTEROPERABILITY EXECUTIVE COMMITTEE

Vision statement

Public safety officials throughout Washington are able to communicate using interoperable technology in real time and on demand.

Definitions for key concepts included in vision statement:

Real Time

There should be no noticeable delay between the time that information is sent and when it is received **(SIEC Advisory Working Group).**

On Demand

Immediately available when mission requires. Must be available under any circumstances **(SIEC Advisory Working Group).**

Mission statement

In the interests of public safety, the State Interoperability Executive Committee (SIEC) pursues and promotes statewide interoperability policies and standards, which will ensure reliable interoperable emergency communications.

Definitions for key concepts included in mission statement:

Interoperability

An essential communication link within public safety and public service wireless communications systems, which permits units from two or more different entities to interact with one another and to exchange information according to prescribed method in order to achieve predictable results **(SIEC Advisory Working Group).**

SIEC MEMBERSHIP

James Broman, Chief
Lacey Fire Department and President of the Washington State Association of Fire Chiefs

James M. Broman serves as the fire chief of Lacey Fire District #3, which serves 71,000 citizens, located over 70 square miles in northeastern Thurston County. The district employs 74 career members along with 95 volunteer personnel used throughout the many agency programs. Broman serves on the Governor's Fire Protection Policy Board and is the chair of the Professional Development Committee for the International Association of Fire Chiefs.

Broman holds a M.A. in public administration and received his chief fire officer designation credentials through the Commission of Fire Accreditation International.

Broman started his career as a firefighter with the Meridian Township Fire Department in Michigan. Prior to coming to Washington, he served as fire chief for the City of Englewood, Colorado and the City of Wheaton, Illinois.

John Conrad, Assistant Secretary
Washington State Department of Transportation

John F. Conrad is the assistant secretary for the Washington State Department of Transportation's Engineering and Regional Operations. Conrad serves as chief engineer and oversees daily operations of the agency's engineering, environmental, maintenance and highway construction programs. He is also responsible for the operations of the agency's six regional offices.

Conrad holds a M.S. in transportation planning from Kansas State University and a B.S. in civil engineering from the University of Nebraska.

Conrad is a registered professional engineer in the states of Washington and Kansas. He is chairman of the AASHTO Subcommittee on Operations and Management and is the author of several papers. Conrad is a member of the Transportations Research Board, American Society of Civil Engineers and the AASHTO Standing Committee on Highways. Prior to his current position, he was employed with the Parsons Brinckerhoff firm working in the United Kingdom on highway program management. Previous to that assignment, he worked at with the Department of Transportation for 23 years, were he held the position of Assistant Secretary for Field Operations Support, among other positions.

Mary Corso, State Fire Marshal
Washington State Patrol

Mary L. Corso serves as the state fire marshal. The state fire marshal is responsible for mobilizing the state's firefighting resources during a Governor-declared emergency such as wild fires and other disasters. As the director of the Fire Protection Bureau of the Washington State Patrol, Corso is responsible for providing service to fire districts, government agencies, members of the media and the general public. Services include fire investigations; fire incident reporting and data collection; fire code review and adoption; construction plan review for fire sprinkler and alarm systems; and fire inspections of high-risk occupancies that house elderly and vulnerable populations. Additionally, the fire marshal regulates the fireworks and sprinkler industry through a licensing program. Corso operates the State Fire Training Academy, which provides training to the state's fire departments and districts, and the Certification Program through a standards and accreditation process.

Corso is a graduate of the Fire Protection Program in North Hennepin Community College in Minnesota.

Corso has served on several national committees of the United States Fire Administration; National Fire Information Council; National Fire Protection Association; National Association of State Fire Marshals, and the Pacific Northwest Wild land Coordinating Group and the Firewise Communities Working Group. State Fire Marshal Corso began her career as a firefighter in 1977, and in 1989 joined the Minnesota State Fire Marshal Division.

Tom Griffith, Director
Clark Regional Emergency Services Agency

Tom Griffith serves as the director of the Clark Regional Emergency Services Agency. In that capacity, he is responsible for directing all agency programs: 9-1-1 Operations, Public Safety Dispatch, Emergency Management, Emergency Medical Services and Regional Radio Systems. Griffith coordinates services with customer agencies and the public and represents the agency at local, state and federal levels.

Griffith holds a B.A. in management from Santa Monica College and an A.A. in police science from the University of California-Riverside.

Prior to his arrival in Clark County, he worked as a supervisor at the Los Angles Police Department as a commissioned officer.

Ken Irwin, Sheriff
Yakima County Sheriff's Department, representing Washington state sheriffs
Ken Irwin is the sheriff of Yakima County, serving the 222,581 citizens of Yakima County. As the second largest county in Washington with over 4,291 square miles, Irwin's challenges are many. With an emphasis on customer service, improving response time and solving crimes, the sheriff is kept busy.

Irwin holds an AA from Yakima Valley Community College, and is a graduate of the FBI National Academy, and the Northwest Law Enforcement Executive Command College.

Irwin has more than 31 years in law enforcement, with 25 years at the Yakima County Sheriff's Department. Prior to his arrival in Yakima, he was a patrol officer in the Las Vegas Metropolitan Police Department.

Mark Kahley, Resource Protection Division Manager
Washington Department of Natural Resources
Mark Kahley was appointed as the Resource Protection Division manager for the Washington State Department of Natural Resources in January 2001, and was challenged with what was then the largest fire season in the State of Washington in the past 20 years. He is a veteran leader and manager of large organizations with command experience in airlift operations, logistics and command and control of deployed forces. His background includes extensive experience in worldwide command, control and communications of airlift forces, as well as command and management forces deployed in crisis situations.

For the past three years, he has been responsible for the protection of over 12 million acres of state and private lands from destruction by wildfire. His division is responsible for all aspects of forest firefighting, from prevention and preparedness through fire suppression, as well as forest health and cooperative programs providing services and assistance to private landowners, municipalities, counties and fire districts.

Kahley also has experience in the real estate industry and community planning, having served as chair of the University Place Planning Commission. In the private sector he served as president of the University Place Division of the Tacoma-Pierce County Chamber of Commerce, as a member of the Chambers Creek Properties Master Site Plan Citizens Committee, several planning and ad hoc committees to deal with challenges in the Hilltop area of Tacoma and downtown Tacoma. He has written successful grants for the Hilltop Action Coalition, Bryant Neighbors and others.

Kahley currently serves as a member of the State Fire Protection Policy Board, alternate member of the State Emergency Management Council, member of the Tacoma Convention Center Public Facilities District Board, the State Interoperability Executive Committee, president emeritus of the Chambers Creek Foundation and vice-chair of the Pacific Northwest Wildfire Coordinating Group Steering Committee.

He is founder of a foundation to develop a 950-acre environmental, recreational and educational complex in a former gravel quarry. He lives in University Place, Washington with his wife.

Alan Komenski, Emergency Communications Manager
Bellevue Police Department, representing the Association of Washington Cities

Alan H. Komenski is the emergency communications manager for the Bellevue Police Department. In that position he is responsible for the management of the Eastside Regional Emergency Communications Center. This center serves police and fire agencies in the northern and eastern suburbs of Seattle with a total population of more than 650,000 people. Komenski has extensive experience in: communications center management and operations; 800 MHz trucked radio system design; planning and implementation of computer aided dispatch systems; E-9-1-1 planning and implementation; communication center consolidation and regional planning as well as emergency and disaster preparedness, planning and coordination.

Komenski holds a B.A. in political science from Oklahoma City University; he has both a F.C.C. General Radio Telephone and an Extras Class Amateur Radio License.

Komenski is the current chairman of the King County Regional Communications Board, a member of the King County 9-1-1 P.S.A.P. Managers Committee, APCO, National Emergency Number Association and many others. Prior to his arrival in Washington (1993) Komenski held several positions in New York and Minnesota when he started his career in 1973 as a public safety radio technician.

Timothy Lowenberg, Adjutant General
Washington State Military Department

Major General Timothy J. Lowenberg was appointed adjutant general of Washington in September 1999. In his current assignment, Lowenberg serves as the director of the Washington State Emergency Management Division and is the Homeland Security advisor for the Governor. As the adjutant general, he guides the preparation of the Washington Army and Air National Guard citizen soldiers and airmen to respond in times of state or national emergency. He is responsible for federal and state missions, assignment of leaders, recruiting, training, equipping, mobilization, facilities and public relations. He is also responsible for formulating, developing and coordinating all policies, plans and programs affecting the Army National Guard and the Air National Guard members in Washington.

Lowenberg is a distinguished graduate of the Air Force Reserve Officer Training Corps (ROTC). He received his commission in 1968 concurrent with a B.A. degree in political science from the University of Iowa. He earned his J.D. from the University of Iowa College of Law in 1971.

Previous to this assignment, as the Air National Guard assistant to the judge advocate general, he oversaw formulation, development and coordination of legal policies, plans and programs affecting more than 114,000 Air Guard members in more than 1,100 units throughout the United States, Puerto Rico, Guam and the Virgin Islands. In addition, he coordinated the accession, training, and deployment of all Air Guard judge advocates and paralegals and was responsible for developing and executing the worldwide civil affairs (nation-building) mission of the U.S. Air Force.

Stuart McKee, Director
Washington State Department of Information Services

Stuart McKee was appointed director of the Washington State Department of Information Services (DIS) by Governor Gary Locke in April 2002. As director, McKee serves as chief information officer for the state and heads an agency that provides technology leadership for government organizations across Washington. As a full-service technology agency, DIS develops standardized information technology protocols, and builds out the state's digital government enterprise with innovative and reliable telecommunications and computing architectures.

McKee holds a M.B.A. from Gonzaga University in Spokane and a B.S. in business administration/management accounting from Lewis-Clark College in Lewiston, Idaho.

McKee was most recently vice president of Global Internet Operations for the Walt Disney Internet Group where he directed a number of the Internet's most visible sites including ESPN.com, Disney.com, ABCNews.com and GO.com. Prior to the Walt Disney Internet Group, he served as general manager and senior executive producer for GO.com, where he managed all aspects of GO.com's personnel.

Ronal Serpas, Chief
Washington State Patrol

Chief Ronal Serpas is the 19th Chief of the Washington State Patrol. He was appointed by Governor Gary Locke on August 1, 2001. The WSP is a statewide law enforcement agency employing more than 2,200 personal. Chief Serpas oversees the day-to-day management of the agency's six bureaus: Field Operations Bureau, Fire Protection Bureau (State Fire Marshal), Forensic Laboratory Bureau, Investigative Services Bureau, Management Services Bureau and Technical Services Bureau.

Chief Serpas graduated from the University of New Orleans in May 1998, receiving his Ph.D. in urban studies, specializing in urban crime. Chief Serpas is a graduate of the 25th Session of the FBI National Executive Institute. In addition to his professional duties, Chief Serpas has served as an assistant professor of criminal justice, extraordinary faculty, Loyola University New Orleans, teaching graduate and undergraduate courses from 1993 until his relocation to Washington state.

Chief Serpas is an executive board member of the Washington Association of Sheriffs and Police Chiefs; executive board member for the Western States Information Network; Washington Criminal Justice Training Commission; Washington Traffic Safety Commission; chair of the Governor's Methamphetamine Coordinating Council; member of the International Association of Chiefs of Police; Forensic Investigation Council; Governor's Council on Substance Abuse; Governor's Emergency Management Council; and the Washington Law & Justice Advisory Council. In 1998, he was a National board member of the COPS National Community Oriented Policing Resource Board, Department of Justice, Office of Community Oriented Policing Services.

Rob Sofie, Chief of Police
City of Snohomish, representing Washington state police chiefs
Rob Sofie has been the director of Public Safety for the City of Snohomish since 1998. As the director of Public Safety he is the chief of police, fire department contract administrator, as well as the city disaster preparedness coordinator.

Sofie holds a B.S. in law and justice from Central Washington University, and an A.A. in criminal justice from Shoreline Community College. He is a graduate of the FBI National Academy as well as the Command College, and WASPC Leadership Institute.

Prior to his appointment to this position, Sofie was a commander in the Renton Police Department. Sofie began his career in King County working for the General Services Department. He has been a commissioned police officer since 1978. He currently serves as a team leader for the Commission of Accreditation for Law Enforcement. Sofie serves on many boards and commissions including: past president of the Snohomish County Sheriffs and Police Chiefs Association; Governor's Juvenile Justice Commission; board member of the Department of Emergency Management; Commission on Police Ethics; vice chair of the Washington State Law Enforcement and Training Standards Board; Domestic Violence Task Force; Community Health and Safety Network; Substance Abuse Advisory Committee; Economic Revitalization Task Force; Sno-Pac Communications Board; Snohomish County Law and Justice Council; and Sno County E-911 Board, among many more.

Glen Woodbury, Director
Emergency Management Division
Glen L. Woodbury was appointed director of the Emergency Management Division (EMD) in 1992. Emergency Management is a division of the Washington Military Department that includes the Washington Army National Guard and the Washington Air National Guard. EMD coordinates emergency management programs with local governments, public agencies, private organizations, businesses, communities and individuals to prepare for, respond to and recover from emergencies. There are four units within this division: Enhanced 9-1-1; Mitigation, Analysis and Planning Response and Recovery, and Policy, Programs and Training. The critical mission of EMD is to minimize the impacts of emergencies and disasters on the people, property, environment and the economy of Washington state.

Woodbury holds a B.A. in engineering sciences from Lafayette College.

Woodbury has served as a volunteer firefighter in East Olympia and currently serves on the District's Citizen Advisory Council. He currently serves as the president of the National Emergency Management Association, a member of the board of directors of the Western States Seismic Policy Council, vice-chair of the Washington State Seismic Safety Committee, the emergency management representative to the Advanced National Seismic System National Steering Committee, a board member of the Council of State Governors, a member of the International Association of Emergency Managers, on the Washington State Committee on Terrorism, Washington State Emergency Management Association, and on the Washington State Fire Defense Committee.

Howard "Mike" Doherty, Jr., Commissioner, Clallam County Government representing the Washington State Association of Counties

Mike Doherty serves as commissioner in the Third District of Clallam County. As the chair of the Clallam County Board of Freeholders, Doherty helped design a process that resulted in the drafting and passage of the Clallam County Charter. Subsequently serving as a county commissioner between 1976 and 1980, he participated in the implementation of a new charter for Clallam County, where he is currently serving as commissioner.

Doherty holds a J.D. from Georgetown University after completing undergraduate and graduate degrees from Peninsula College and Gonzaga University. He served as adjunct faculty at Peninsula College for over 20 years, teaching business law and American government.

Currently serving on the OPSCAN Board, Doherty has served on many state and local boards and commissions. He has testified before committees of both houses of the Washington State Legislature and the United States Congress, as well as the National Energy Board of Canada.

APPENDIX C

PORTABLE RADIO INVENTORY DATA

	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Recreation	National Guard	Total
Total # of portable radios	1290	450	317	13	1219	3590	5	33	400	601	7,918
Primary manufacturer	Kenwood	E.F. Johnson	Motorola	Motorola	Relm	Motorola	E.F. Johnson	Motorola	Kent & King	Various	
Primary model number or type	TK290	Viking 8587	HT1250	MX360	GPH	HT1000	242-8160-2	JT 750	TK290	Various	
Frequency band	148-174	851-869	148-174	138-144	148-174	851-869	851-869	148-174	148-174	No Data	
Percentage P-25	0	0	50	0	0	0	0	80	0	34	
Percentage P-25 capable	0	0	50	0	100	0	0	10	0	34	
Percentage analog	100	95	50	100	100	81	100	10	100	47	
# of analog radios	1250	428	159	13	1219	2908	5	4	400	282	6,708
# of digital radios	0	22	158	0	0	682	0	29	0	319	1,210
Percentage trunked	0	95	0	0	0	17	100	0	0	34	
Percentage conventional	100	5	100	100	100	81	100	0	100	100	

APPENDIX D

MOBILE RADIO INVENTORY DATA

	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Recreation	National Guard	Total
Total # of mobile radios	1100	4050	690	127	1012	195	0	20	225	1116	8,535
Primary manufacturer	Motorola	E.F. Johnson	Motorola	Midland	Motorola	Motorola		Motorola	Motorla	Various	
Primary model number or type	SyntorX900SP	Summit DM	Astro	70-050C	Spectra Astro	MCS 2000		CDM 1550	Syntor x 9000 VHF	Various	
Frequency band	148-174	851-869	148-174	25-50	148-174	851-869		148-174	148-174	No Data	
Percentage P-25	11	0	25	0	80	3	0	80	10	3	
Percentage P-25 capable	10	0	25	0	80	0	0	10	10	3	
Percentage analog	100	95	75	100	20	75	0	10	100	7	
# of analog radios	1100	4275	518	127	203	147	0	2	225	78	6,225
# of digital radios	0	225	172	0	809	48	0	18	0	1038	2,310
Percentage trunked	0	95	0	0	0	9	0	0	0	6	
Percentage conventional	100	5	100	100	100	75	0	0	100	100	

APPENDIX E

BASE STATION RADIOS/REPEATERS INVENTORY DATA

	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Recreation	National Guard	Total
Total # of radios/repeaters	215	350	5	13	106	78	1	0	15	39	822
Frequency band	148-174	851-869	148-174	25-50	148-174	851-869	806-824		148-174		
Percentage equipment in base station configuration	88	1	40	84	20	32	18	0	100		
Percentage equipment in repeater configuration	12	99	60	15	80	68	0	0	0		
Primary manufacturer	Motorola	E.F. Johnson	Motorola	Midland	Motorola	Motorola	E.F. Johnson		Motorola & King		
Primary model number or type	Quantar	Summit QX	Quantar	70-0500C	Quantar	Quantar	"Base Station"		LMH		
Percentage P-25	0	0	100	0	90	0	0	0	0	29	
Percentage P-25 capable	100	0	100	0	90	8	0	0	0	29	
Percentage analog	100	99	0	100	10	62	100	0	100	3	
# of analog radios/repeaters	215	347	0	13	11	49	1	0	15	1	652
# of digital radios/repeaters	0	3	5	0	95	29	0	0	0	38	170
Percentage trunked	0	99	0	0	0	11	100	0	0	29	
Percentage conventional	100	1	100	100	100	62	100	0	100	100	

APPENDIX F

CELLULAR AND PAGER EQUIPMENT INVENTORY DATA

	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Recreation	National Guard	Total
CELLULAR TELEPHONES											
Estimated quanity	700	800	874	76	240	1286	300	50	400	173	4,899
Primary cellular provider	ATT	ATT	ATT	ATT	ATT	Nextel	ATT	ATT	Nextel	No Data	
Percentage cellular phones analog	10	25	10	0	0	13	20	0	50	No Data	
Percentage cellular phones digital	90	75	90	100	100	86	80	100	50	No Data	
Percentage cellular phones support text	50	1	10	100	20	73	10	0	10	No Data	
Additional cellular providers	Verizon Nextel Sprint T-Mobile	Nextel US Cellular	Verizon Cellular One US Cellular	Verizon Sprint	Verizon	Verizon ATT Cellular One		Verizon	Verizon	No Data	
PAGERS											
Estimated quantity	1200	1000	75	95	384	970	270	80	200	10	4,284
Primary pager provider	Arch	Metrocall	Verizon	Metrocall	Arch	Metrocall	Metrocall	ATT	Misc	No Data	
Percentage pagers support text message	100	30	90	100	20	26	100	0	25	No Data	
Additional pager providers	Metrocall		ATT/Nextel Nextel		Metrocall	Arch Password Telewaves Verizon Qwest	ATT		Misc	No Data	

APPENDIX G

INTEROPERABILITY EQUIPMENT INVENTORY DATA

	WSP	WSDOT	DFW	EMD	DNR	DOC	DOH	Ecology	Parks & Rec	National Guard	Total
ICRI	0	0	0	1	0	0	0	0	0	0	1
JPS/Raytheon ACU-1000	8*	0	0	0	0	1	0	0	0	0	9
Transpeater	0	35	0	1	10	0	0	0	0	1	47
Satellite phones	0	5	0	30	0	11	5	1	0	20	72
CMD750 radios @ 45-50 MHz vehicles w/ EOC	0	0	0	0	0	0	0	<20	0	0	0
Crossband repeaters	0	0	0	3	0	0	0	0	0	0	3

** Washington State Patrol obtained funding for the eight ACU-1000s, but has not yet taken delivery of these.*

APPENDIX H

FINANCIAL ANALYSIS DETAIL
(FIGURES SHOWN ARE ESTIMATES ONLY)

Washington State Patrol	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	Kenwood	TK290	1290	$900	$1,161,000	$1,750	$2,257,500
Mobile	Motorola	Syntor X9000SP	1100	$4,352	$4,787,200	$7,000	$7,700,000
Base Station/Repeater	Motorola	Quantar	215	$12,200	$2,623,000	$12,500	$2,687,500
Base Station 88%			189	See Above			
Repeater 12%			26	See Above			
Console equipment	Motorola	Centracom 2	40	$60,000	$2,400,000	$60,000	$2,400,000
ICRI							
ACU-1000	JPS/Raytheon	ACU 1000	6	$47,000	$282,000	$47,000	$282,000
Transpeater							
Satellite phones							
CMD750 radios							
Crossband Repeaters							
Cellular phones		ATT	700	$100	$70,000	$100	$70,000
Pagers		Arch	1200	$50	$60,000	$50	$60,000
Mobile Data		WSP	300	$5,000	$1,500,000	$7,000	$2,100,000
Estimated Values					**$12,883,200**		**$17,557,000**

FINANCIAL ANALYSIS DETAIL

Washington State Dept of Transportation	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	E.F. Johnson	Viking 8587	450	$2,500	$1,125,000	$2,500	$1,125,000
Mobile	E.F. Johnson	Summit DM	4050	$3,700	$14,985,000	$3,700	$14,985,000
Base Station/Repeater	E.F. Johnson	Summit QX	350	$12,000	$4,200,000	$12,000	$4,200,000
Base Station 1%			4				
Repeater 99%			346				
Console equipment	Orbacom System	TDM-150	11	$75,000	$825,000	$75,000	$825,000
ICRI							
ACU-1000							
Transpeater							
Satellite phones			35	$2,000	$70,000	$2,000	$70,000
CMD750 radios							
Crossband Repeaters							
Cellular phones		ATT	800	$100	$80,000	$100	$80,000
Pagers		Metrocall	1000	$50	$50,000	$50	$50,000
Mobile Data							
Estimated Values					**$21,335,000**		**$21,335.000**

Department Fish & Wildlife	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	Motorola	HT1250	317	$750	$237,750		
Mobile	Motorola	Astro	690	$3,500	$2,415,000	$3,500	$2,415,000
Base Station/Repeater	Motorola	Quantar	5	$12,200	$61,000	$12,200	$61,000
Base Station 60%			3	See Above			
Repeater 40%			2	See Above			
Console equipment	Zetron		1	$54,000	$54,000	$54,000	$54,000
ICRI							
ACU-1000							
Transpeater							
Satellite phones			30	$3,000	$90,000	$3,000	$90,000
CMD750 radios			30	$650	$19,500	$650	$19,500
Crossband Repeaters							
Cellular phones		ATT	874	$100	$87,400	$100	$87,400
Pagers		Metrocall	1000	$50	$50,000	$50	$50,000
Mobile Data	Dell	ATT/CDPD	90	$2,000	$180,000		
Estimated Values					**$3,194,650**		**$2,776,900**

FINANCIAL ANALYSIS DETAIL

Emergency Management	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	Motorola	MX360	13	$1,500	$19,500	$4,400	$57,200
Mobile	Midland	70-050C	127	$650	$82,550	$650	$82,550
Base Station/Repeater	Midland	70-0500C	13	$7,500	$97,500	$7,500	$97,500
Base Station 85%			11	See Above			
Repeater 15%			2	See Above			
Console equipment	Zetron	Series 4000	3	$54,000	$162,000	$54,000	$162,000
ICRI		ICRI	1	$5,000	$5,000	$5,000	$5,000
ACU-1000							
Transpeater							
Satellite phones		Satellite Phone	30	$3,000	$90,000	$3,000	$90,000
CMD750 radios	Motorola	CMD 750	1	$650	$650	$650	$650
Crossband Repeaters			4	$500	$2,000	$550	$2,200
Cellular phones		ATT	76	$100	$7,600	$100	$7,600
Pagers		Metrocall	95	$50	$4,750	$50	$4,750
Mobile Data		Sprint (3G)	16 (CDPD)	$250	$4,000	$250	$33,250
Estimated Values					**$475,550**		**$542,700**

Dept of Natural Resources	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	Relm	FPH	1219	$850	$1,036,150	$1,700	$2,072,300
Mobile	Motorola	Spectra Astro	1012	$3,500	$3,542,000	$3,500	$3,542,000
Base Station/Repeater	Motorola	Quantar	106	$12,200	$1,293,200	$12,200	$1,293,200
Base Station 20%			21	See Above			
Repeater 80%			85	See Above			
Console equipment	Motorola	Centracom Gold Elite	24	$100,000	$2,400,000	$100,000	$2,400,000
ICRI						$1,875	$322,500
ACU-1000							
Transpeater		Transpeater	10	$6,800	$68,000	$6,800	$68,000
Satellite phones							
CMD750 radios							
Crossband Repeaters							
Cellular phones		ATT	240	$100	$24,000	$100	$24,000
Pagers		Arch	384	$50	$19,200	$50	$19,200
Mobile Data							
Estimated Values					**$8,382,550**		**$9,741,200**

FINANCIAL ANALYSIS DETAIL

Department of Corrections	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	Motorola	HT 1000	3590	$1,450	$5,205,500	$1,750	$6,282,500
Mobile	Motorola	MCS 2000	195	$2,393	$466,635	$3,500	$682,500
Base Station/Repeater	Motorola	Quantar	78	$12,200	$951,600	$12,200	$951,600
Base Station 20%			16	See Above			
Repeater 80%			62	See Above			
Console equipment	Motorola	Centracom B1822A	11	$35,000	$385,000	$60,000	$660,000
ICRI							
ACU-1000		ACU 1000	1	$47,000	$47,000	$47,000	$47,000
Transpeater							
Satellite phones		Satellite Phones	11	$2,000	$22,000	$2,000	$22,000
CMD750 radios							
Crossband Repeaters							
Cellular phones		Nextel	1286	$100	$128,600	$100	$128,600
Pagers		Metrocall	970	$50	$48,500	$50	$48,500
Mobile Data		ATT	133 CDPD	$250	$33,250	$250	$33,250
Estimated Value					**$7,288,085**		**$8,855,950**

Department of Health	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	E. F. Johnson	242-8160-2	5	$1,700	$8,500	$1,700	$8,500
Mobile							
Base Station/Repeater	E. F. Johnson	"Base Station"	1	$11,500	$11,500	$11,500	$11,500
Base Station 100%			1	See Above			
Repeater 0%			0	See Above			
Console equipment							
ICRI							
ACU-1000							
Transpeater							
Satellite phones							
CMD750 radios							
Crossband Repeaters							
Cellular phones		ATT	300	$100	$30,000	$100	$30,000
Pagers		ATT	80	$50	$4,000	$50	$4,000
Mobile Data							
Estimated Value					**$54,000**		**$45,500**

FINANCIAL ANALYSIS DETAIL

Department of Ecology	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	Motorola	JT 750	33	$900	$29,700	$900	$29,700
Mobile	Motorola	CDM 1550	20	$830	$16,600	$830	$16,600
Base Station/Repeater							
Base Station							
Repeater							
Console equipment							
ICRI							
ACU-1000							
Transpeater							
Satellite phones		Satellite phone	1	$2,000	$2,000	$2,000	$2,000
CMD750 radios	Motorola		20	$650	$13,000	$650	$13,000
Crossband Repeaters							
Cellular phones		ATT	50	$100	$5,000	$100	$5,000
Pagers		ATT	80	$50	$4,000	$50	$4,000
Mobile Data							
Estimated Value					**$70,300**		**$70,300**

State Parks & Recreation	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	Kenwood	TK290	400	$900	$360,000	$900	$360,000
Mobile	Motorola	Syntor x 9000 VHF	225	$2,200	$495,000	$3,500	$787,500
Base Station/Repeater	Motorola & King	LMH	15	$12,200	$183,000	$12,200	$183,000
Base station 100%			15	See Above			
Repeater 0%			0	See Above			
Console equipment							
ICRI							
ACU-1000							
Transpeater							
Satellite phones							
CMD750 radios							
Crossband Repeaters							
Cellular phones		Nextel	400	$100	$40,000	$100	$40,000
Pagers		Misc	200	$50	$10,000	$50	$10,000
Mobile Data		WSP	1	$2,500	$2,500	$2,500	$2,500
Estimated Value					**$1,090,500**		**$1,383,000**

FINANCIAL ANALYSIS DETAIL

National Guard	Manufacturer	Model	Number	Est Unit Cost When New	Est Initial Investment	Est Unit Replacement Cost	Est System Replacement Cost
Portable	Motorola	XTS 5000	601	$0	$0	$0	$0
Mobile	Military Contract	Freq-hopping secure	1116	$0	$0	$0	$0
Base Station/Repeater	Harris	RT 1446	39	$0	$0	$0	$0
Base Station			15	See Above			
Repeater			0	See Above			
Console Equipment							
ICRI							
ACU 1000							
Transpeater							
Satellite phones							
CMD 750 radios							
Crossband Repeaters							
Cellular phones		Nextel	400	$0	$0	$0	$0
Pagers		Misc	200	$0	$0	$0	$0
Mobile Data		WSP	1	$0	$0	$0	$0
Estimated Value					**$0**		**$0**

Estimated Costs for State Government-Operated Radio, Interoperability, Cellular and Pager Equipment (from above)				**Estimated Initial Investment Cost:**	**$ 54,773,835**	**Estimated Replacement Cost:**	**$ 62,307,550**

Infrastructure Assets					
State Microwave sites	90	$1,000,000	$90,000,000		$90,000,000
	90	$250,000	$22,500,000		$22,500,000
	116	$100,000	$11,600,000		$11,600,000
Estimated Costs for State Government-Operated Infrastructure Assets (not including cost of land)	296		**$124,100,000**		**$124,100,000**
Estimated Costs for State Government-Operated Radio *and* Infrastructure Assets (not including cost of land)			**$178,873,835**		**$186,407,550**

APPENDIX I

ESTIMATED NUMBER OF DEVICES INVENTORIED

AGENCY	Portable	Mobile	Base Station/ Repeater	Console Positions	Cellular	Pagers	Mobile Data	TOTAL BY AGENCY
Washington State Patrol	1290	1100	215	40	700	1200	300	**4,845**
Department of Transportation	450	4050	350	11	800	1000	0	**6,661**
Fish and Wildlife	317	690	5	1	874	75	80	**2,042**
Emergency Mgmt Division	13	127	13	3	76	95	18	**345**
Natural Resources	1219	1012	106	24	240	384	0	**2,985**
Department of Corrections	3590	195	78	11	1286	970	133	**6,263**
Department of Health	5	0	1	0	300	270	0	**576**
Department of Ecology	33	20	0	0	50	80	0	**183**
State Parks and Recreation	400	225	15	0	400	200	1	**1,241**
National Guard	601	1116	39	0	173	10	1	**1,937**
Total State Assets	**7,918**	**8,535**	**822**	**90**	**4,899**	**4,284**	**533**	**27,078**